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U. S. DEPARTMENT OF AGRICULTURE.
OFFICE OF EXPERIMENT STATIONS—FARMERS' INSTITUTE LECTURE 10 (Rev.).

A. C. TRUE, Director.

SYLLABUS

OF

ILLUSTRATED LECTURE

ON THE

PRODUCTION AND MARKETING OF
EGGS AND FOWLS.

By

JAMES DRYDEN,

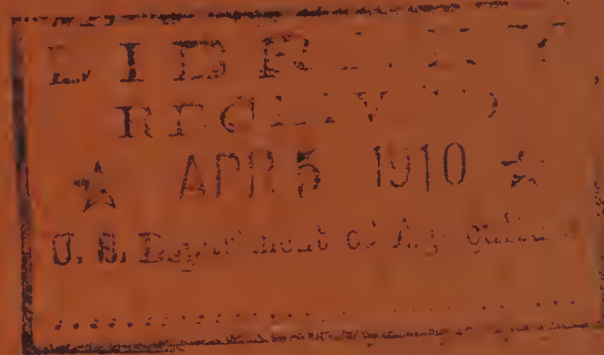
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LIST OF ILLUSTRATED LECTURES.

- Farmers' Institute Lecture 1. Syllabus of Illustrated Lecture on the Care of Milk, accompanied with 44 lantern slides. By R. A. Pearson. Pp. 12. 1904.
- Farmers' Institute Lecture 2. Syllabus of Illustrated Lecture on Potato Diseases and their Treatment, accompanied with 47 lantern slides. By F. C. Stewart and H. J. Eustace. Pp. 30. 1904.
- Farmers' Institute Lecture 3. Syllabus of Illustrated Lecture on Acid Soils, accompanied with 53 lantern slides. By H. J. Wheeler. Pp. 28. 1904.
- Farmers' Institute Lecture 4. Syllabus of Illustrated Lecture on Profitable Cattle Feeding, accompanied with 45 lantern slides. By F. B. Mumford. Pp. 21. 1905.
- Farmers' Institute Lecture 5. Syllabus of Illustrated Lecture on Silage and Silo Construction for the South, accompanied with 50 lantern slides. By A. M. Soule. Pp. 31. 1905.
- Farmers' Institute Lecture 6. Syllabus of Illustrated Lecture on Essentials of Successful Field Experimentation, accompanied with 32 lantern slides. By C. E. Thorne. Pp. 24. 1905.
- Farmers' Institute Lecture 7. Syllabus of Illustrated Lecture on Roads and Road Building, accompanied with 41 lantern slides. By the Office of Public Roads, U. S. Department of Agriculture. Pp. 16. 1907.
- Farmers' Institute Lecture 8. Syllabus of Illustrated Lecture on Farm Architecture, accompanied with 48 lantern slides. By Elmina T. Wilson. Pp. 19. 1907.
- Farmers' Institute Lecture 9. Syllabus of Illustrated Lecture on Tobacco Growing, accompanied with 46 lantern slides. By J. N. Harper. Pp. 15. 1907.

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PREFATORY NOTE.

This revised syllabus of a lecture upon the production and marketing of eggs and fowls, by James J. Dryden, professor of poultry husbandry, Oregon Agricultural College and Experiment Station, is accompanied by 45 views illustrating this topic. The syllabus and views have been prepared for the purpose of aiding farmers' institute lecturers in their presentation of this subject before institute audiences.

The numbers in the margins of the pages of the syllabus refer to similar numbers on the lantern slides and to their legends as given in the Appendix; those in the body of the text refer to the list of authorities and references, page 20.

In order that those using the lecture may have opportunity to fully acquaint themselves with the subject, references to its recent literature are given in the Appendix.

JOHN HAMILTON,
Farmers' Institute Specialist.

Recommended for publication.

A. C. TRUE, *Director.*

Publication authorized.

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *March 15, 1910.*

THE PRODUCTION AND MARKETING OF EGGS AND FOWLS.

By JAMES DRYDEN.

INTRODUCTION.

View.

Probably no other branch of agriculture interests a greater number of people than poultry keeping. Soil or climatic conditions do not prescribe limits for the poultry industry. The poultryman is found in every State and in every county of the Union, and the farm without some poultry is almost an anomaly. The farmer, however, does not monopolize the poultry business. The villager with his back lot, the suburban resident of the city, the needy invalid unable to work at hard labor, the woman in search of a livelihood, the man of wealth on his country estate, the practical farmer on his farm—all have an interest in fowls, either as a means of livelihood, a mental diversion, a pleasure, or a profit.

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Since the last United States census was taken the commercial importance of the poultry industry has been better understood. The census returns showed a value of poultry and eggs produced on the farms that year of approximately \$300,000,000, without including the amount produced in towns and villages. (Ref. 1, p. 630.) Since then prices of poultry products have advanced, and the industry has been growing. Taking these factors into consideration, the estimate of the value of poultry products for 1908 of over \$600,000,000, made by the United States Department of Agriculture, is undoubtedly conservative. (Ref. 2, p. 15.) They equaled the value of the wheat crop of the United States for 1908, and exceeded the value of all the coal and petroleum produced in 1902. (Ref. 3, p. 44.)

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EGG PRODUCTION.

USES OF EGGS.

The uses of the egg are varied. As a food it is unexcelled. The invalid and the strong use the egg without question as to its high nutritive qualities, and it has never yet been success-

View.

fully substituted or adulterated. In composition eggs resemble moderately lean beef and fish. Eight average eggs will make a pound. Eggs are extensively used in the arts, as in furnishing the albumen with which photographic paper is coated.

A writer many years ago said: "Out of bugs and worms and seeds and what it can pick and scratch from the waste of nature's laboratory the hen prepares the fair white egg—one of the most delicious morsels to the human palate and one to fill the heart of man with loving kindness."

QUALITY AND SIZE OF EGGS.

(a) Eggs vary greatly in flavor and quality. Undesirable flavors may be detected in the egg after feeding the hens heavily on foods of strong or high flavor. If fed in sufficient quantity, beef scrap will give an odor to the egg. It is important that no beef scrap be fed except of good quality. Onions will give an undesirable flavor to the egg, and if a sufficient quantity be eaten by the hen the eggs will be unfit for use. (Ref. 4, p. 505.) There will be no perceptible flavor, however, from either onions or good beef scrap if fed in normal quantities. Only when hens have been starved on green food and animal food and then given all they will eat of either onions or beef scrap will any flavor from these foods be detected in the egg.

(b) It has been shown that certain foods affect the color of the egg; feeding alfalfa liberally will give yolks of high color. (Ref. 5, p. 174.) Pale color of yolk usually indicates a lack of green food.

(c) The size of the egg is influenced by factors under the control of the poultryman. The breed should not always be blamed for small eggs. Eggs from fowls having free range where worms, insects, and green food were obtained weighed more than eggs from similar hens kept in small yards. (Ref. 6, p. 207.) Eggs for the fancy market should weigh not less than 22 ounces per dozen, with quality and color unobjectionable. The color of the shell is immaterial, though in some markets the white-shell egg and in others the brown-shell egg brings the higher price. There is no difference, however, in quality between the brown-shell and the white-shell egg.

BREEDS AND LAYING CAPACITY.

5 (a) Laying capacity varies greatly among individual hens.
6 (Refs. 5, p. 117; 7.) This has been discovered by the use
7 of trap nests. Experiment station records show that hens vary
8 from 250 eggs per year to no eggs. Frequently a good-look-

ing hen, in good health, will not pay for the food she eats, while another hen of the same breed and with the same care will lay eggs worth three or four times the cost of the food. It is not known that there is a type or shape characteristic of heavy-laying hens; otherwise it would be an easy matter to rid the flock of the unprofitable fowls. The use of the trap nests involves considerable labor in releasing the hens and in record keeping, more than the farmer with a few hens can profitably give, but he should endeavor to secure "pedigreed" males from some of the experiment stations or from reputable private breeders in order to breed up the laying qualities of his flock.

(b) There is more difference in individuals than in breeds, it is true, but the smaller breeds, such as the Leghorns, are usually the most profitable for egg production. The Leghorns should lay as many eggs as the Plymouth Rocks and breeds of that class on one-fourth less food. (Ref. 5, p. 159.) But the question of profit does not hinge on egg yield alone. In renewing the flock, which it is desirable to do at least once every two years, larger returns will be secured from the sale of the fowls of the larger breeds than from the sale of the Leghorns. A Plymouth Rock hen should weigh about $7\frac{1}{2}$ pounds, while the Leghorn will weigh about half as much. Selling at the same price per pound, the Plymouth Rock should bring in the market as much again as the Leghorn. This will about balance the difference in the cost of feeding. It will cost more to raise the Plymouth Rock to laying maturity than the Leghorn, but this will be offset by the increased price received for the surplus cockerels in the fall.

Leghorns are poor sitters, and eggs should not be trusted to them to incubate. For this reason where Leghorns are kept recourse must be had to incubators or to hens of sitting breeds to hatch the chicks. Leghorns are active, good foragers, and with good care the pullets will begin to lay at five months of age. The larger breeds are usually a month longer in beginning to lay.

Large breeds, such as Brahmas, Cochins, and Langshans, should not be kept for egg production. These are chiefly used where the market demands a large chicken for table purposes. In most markets, however, smaller fowls find more ready sale. The Brahmas and Cochins have meat of excellent quality, and being of a quiet disposition are fitted for the economical production of meat.

(c) In deciding on the breed to keep it should be remembered that the larger the fowl the greater will be the demand for food

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View.

for maintenance of the body, and that eggs are made from the food consumed above that required for maintenance. The smaller breeds, requiring less food for maintenance, are able to produce eggs at a smaller cost than the larger breeds.

The individual differences in fowls, however, are so great that it is possible to find fowls of the larger breeds that will lay more eggs than some fowls of the smaller breeds. On the average farm, where fowls are kept principally for home use, the choice of a medium-sized breed, such as the Plymouth Rock or the Wyandotte, will usually be wise.

15 That the heavy layers are not confined to any one breed has
16 been shown by laying competitions in Australia, which have
17 extended over a period of six years. In three of the six years the White Leghorns laid the most; in two other years the Silver Wyandottes won, and in one year the Black Langshans stood first. These breeds represent the three different classes of fowls, namely, egg breeds, general-purpose breeds, and meat breeds. In the 1906-7 contest the pen of Black Langshans laid an average of 247 eggs per fowl, the White Leghorns 239, and the pen of Silver Wyandottes 199 eggs per fowl.

RENEWING THE FLOCK.

18 The limit of profitable egg production is probably two laying years. (Ref. 5, p. 164.) After the second year the egg yield will scarcely pay for the food consumed by the hen. The first or pullet year is the most productive, and though the eggs laid the second and subsequent years are larger than the pullet eggs, the average flock will make more profit the first year than in any subsequent year. It is important, therefore, that the flock be renewed at least once every two years. In the case of special breeding stock, or of hens that are known to be very prolific, it will pay to keep them longer for breeding purposes. Where necessary to mark the fowls to keep track of their ages it may be done by punching the web of the foot of the chick when it is hatched. A number of different markings may be made in this way. Where fowls are kept two years, it will be sufficient to mark them every other year only. A punch made for the purpose may be purchased of poultry supply dealers.

HOUSING OF FOWLS.

The main consideration in the building of poultry houses is the health of the fowls. Fowls usually show more vigor on the general farm than on the intensive poultry plant. This is largely because intensive methods are not followed so much on the

farm as on the poultry plant. Highly intensive conditions of housing sooner or later result in serious impairment of the constitutional vigor of the fowls. (Ref. 8.)

Houses may be divided into two classes: (1) The colony house, and (2) the stationary house.

THE COLONY HOUSE.

The colony house is a portable house that will accommodate anywhere from 25 to 100 fowls and small enough to be pulled readily by a team of horses. It is not desirable to keep more than 100 fowls in a colony house. A house 7 feet by 12 feet, if properly ventilated, will be large enough for 50 fowls in the warmer sections of the country. In sections where the weather conditions in winter are such that the fowls prefer to remain indoors much of the time, it will pay to provide additional cheap scratching room, or reduce the number of fowls in a house. It is very essential that the house should provide a copious supply of fresh air at all times, but there should be no drafts of cold air on the fowls at night. A low temperature is not necessarily injurious, but extremes of heat and cold should be avoided. The danger of keeping large flocks in small, close houses lies largely in the difference in temperature between the air of the house at night and the outside air. The house is warmed by the body heat of the fowls at night, and the sudden change of temperature to which the fowls are exposed when let out in the morning is frequently the cause of many of the colds and much of the so-called "roup" in the average flock. On the other hand, a roomy house with a relatively small number of fowls in it, having glass windows in the south, will have a high temperature during the day from the sun shining on the glass, while at night there will be a sharp fall in temperature, chilling the fowls and producing colds. There should be no great variation of temperature in the house between night and day.

The most practicable way of overcoming this difficulty is to leave one end of the house largely open. In a colony house with 50 fowls, the space usually occupied by the door would be left open night and day. For protection from wild animals a door made of poultry netting can be used, closing it at night and opening it in the morning. In sections where the snow drifts badly the door may be covered with burlap or some light fabric that will admit the air and at the same time keep the snow out. The frame of the house may be 2 by 4 stuff covered with siding. In place of siding common boards with battens over the cracks may be used. The roof may be of shingles or

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27 of a good quality of roofing paper. Experiments at the Utah Agricultural Experiment Station showed good results with the colony open-front house during cold winters. (Ref. 6, p. 206.) The body warmth of the fowls is relied upon to keep the temperature of the house above that of outdoors, and at the same time the cloth window or curtain front admits a copious supply of fresh air. The open front may be adapted to the stationary house as well as to the colony house.

28 The colony houses should be kept far enough apart and moved often enough to give the fowls clean, fresh ground to range over. Not more than one breed should be kept on the farm, owing to danger from mixing.

It will usually be an advantage to have the nests separate from the house. Separate nests may be more easily kept free from lice and mites than nests in the house. The California plan is to have a small laying house between two colony houses holding about 100 fowls each. Where fowls are kept in large numbers the plan of a separate laying house is a good one. This house may be used for food hoppers as well as nests, thus preventing live stock from getting at the food.

29 The advantages in favor of the colony-house system are (1) that it avoids largely the danger from soil contamination, or
 30 "ground poisoning," which will almost certainly result where
 31 fowls are confined year after year on the same ground; (2) it obviates the necessity of building fences where large numbers are kept; and (3) it simplifies feeding, inasmuch as the fowls, having fresh ground to range over, secure necessary food with which the farmer does not furnish them, either through neglect or inability to secure it.

THE STATIONARY HOUSE.

The long stationary house is usually built with a double wall and a dead-air space, and frequently with packing between the walls. Glass windows are usually placed on the south side of the house. It is impossible to keep such a house warm during cold weather and at the same time dry without artificial heat. There is too great a range of temperature between night and day, and this causes moisture to condense on the walls. This condition may be partially remedied by taking out the glass window and putting a frame of burlap or other cloth in its place. This will give the moisture a chance to escape and will help to equalize the temperature between night and day. The sun striking through the glass window raises the temperature many
 32 degrees, and at night, owing to the glass permitting a rapid

escape of heat, the temperature falls to such a point that condensation takes place. A board shutter over the window at night would check the fall of temperature in the house and to that extent prevent condensation, but in the warmly built house the retention of heat at night is secured at a sacrifice of pure air, while copious ventilation sacrifices the warmth and thus defeats the original plan of the house. To maintain the night temperature and also prevent dampness in the closed type of house it is necessary to heat the house by artificial means, but artificial heat in poultry houses has not proven profitable.

The warmly built house with glass windows, owing to the humid condition of the air, will be practically as cold as a single-boarded house with an open front and is not conducive to good health and best egg production. Such a house, with glass windows removed and cloth frames put in their places, will result in greater comfort for the fowls and better production.

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It is very essential to avoid drafts in poultry houses. Drafts are very frequent causes of colds and rousy conditions among fowls. The long continuous house without partitions is very objectionable on this account. Such a house should have a tight partition, either of boards or of cloth, at least every 50 feet, better every 25 feet. Building such a house on an incline aggravates the trouble from drafts.

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It is not disputed that fowls in a long house with proper ventilation kept in proper sanitary condition and with yards will give good results in egg yield.

Stationary colony houses may often be used with advantage in place of a long house. They permit of a better arrangement of yards. A convenient arrangement is to place them 20 feet apart and have two yards for each house. By cultivating and growing a crop on every alternate yard the ground may be kept cleaner and the danger of contagious diseases spreading from one flock to another will be greatly minimized. The vacant yard between each flock also obviates the trouble of fowls fighting through the fences and injuring themselves.

THE FEEDING OF FOWLS.

In the feeding of poultry on the farm it is neither practicable nor desirable to compound elaborate rations. Where the fowls have the liberty of the fields the question of feeding is very much simplified; they will there pick up a large proportion of their food. If the farmer were to confine his fowls in close yards and feed them the way he usually does on free range, the effect would be a poor egg yield and a loss of vigor in the fowls.

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View.

The nearer we can follow nature's teachings in the feeding of poultry the better will be the results. No set rules can be laid down as to rations, but a knowledge of some of the general principles of foods and feeding, will help the poultryman to avoid mistakes.

FOODS.

Successful feeding of poultry rests largely on a proper combination of foods rather than on any single food. There is no one food that will meet all requirements of the fowl. It is not a question of wheat or corn or oats so much as it is a question of vegetable or animal food, or again, of protein or fats. The real value of corn or wheat has never been fully determined. The chemical composition of wheat is slightly better than that of corn for egg production; that is, it contains more protein than corn. On the other hand, digestion experiments now in progress indicate that a larger percentage of the corn than of wheat is digested or made use of by fowls (Ref. 9), but neither corn nor wheat should form the exclusive diet of the fowls. The excess of fat-forming material is not a disadvantage in corn if it be fed in combination with some other foods rich in flesh-forming or egg-making material. If the fowls have access to animal food, such as meat scraps and the insects that may be found on the farm, they will themselves correct the undue proportion of fat-forming elements in the corn. In other words, they will balance their own rations.

The feeding of poultry is not a question altogether of balanced rations, because a ration may be "balanced" without containing any animal food, and the ration must contain a large proportion of foods of animal origin for good results. The great scarcity of fresh eggs in winter is largely due to a scarcity of animal food and green feed.

There is a close agreement between the food consumed and the product, whether it be eggs or meat. The proper feeding of poultry necessitates a careful study of the composition of foods, as well as of the product. (Ref. 10.)

METHODS OF FEEDING.

Methods of feeding, as well as rations, vary greatly. As already indicated, methods that would be successful with fowls on free range would not be satisfactory for fowls confined in small yards. Where the fowls have the liberty of the fields, which usually furnish a plentiful supply of animal food, satisfactory results will be secured if the farmer will see that they have a liberal supply of grain. Corn or wheat should furnish

the principal grain fed. Whether corn or wheat be fed would depend on the prices of these grains. So far as is now known, the feeding value of these grains under the conditions stated would be about equal. The farmer can rest assured that he is making no very great mistake in feeding liberally either wheat or corn if the market price per pound is the same for each. To mix the two grains, however, will be an advantage. A variety of food will help the appetite. Oats are also excellent for laying fowls, and a little barley by way of variety may be fed. A good quality of wheat screenings may safely be substituted for higher-priced grain.

HOPPER FEEDING.

Under the conditions of the free-range system the hopper method of feeding may be used to advantage. It will make a decided saving in labor and insure a plentiful supply of grain at all times for the fowls. The hoppers may be filled once a week, or as often as necessary, and placed where the fowls can help themselves at will. Dry feeding is more economical in labor than wet mash feeding; but it has not yet been clearly demonstrated that the skillful feeding of wet mash will not produce better results in egg yield than the dry method. (Refs. 11 and 12.)

EXERCISE.

During the winter, when snow lies on the ground any considerable length of time, covering up a large proportion of nature's food, different methods are necessary if eggs are to be secured. In the first place, the exercise which the fowls got in roaming over the fields will have to be provided in another way. Exercise is just as necessary as the food. Access to a straw stack will keep the hens busy scratching for the stray kernel. A pile of clean straw on the floor of the poultry house or in an open shed will be an incentive for exercise if the grain is scattered in it. It is not necessary nor desirable to keep the hens shut up in close quarters just to keep them from getting in the snow. The eating of snow is not detrimental to fowls. (Ref. 13, p. 28.)

ANIMAL FOOD.

There are various forms in which animal food may be fed. Bones and meat may be secured from the butcher, and a bone cutter used to cut them up into small pieces. Horse meat may also be used, and on account of its comparative freedom from tuberculosis it is safer than meat from the butcher's stalls. Skim milk is a good substitute for animal food, but it has the

View.

disadvantage of being so bulky that fowls can not drink enough of it to supply the need for animal food. In order to feed enough milk to supply a large amount of animal protein it is better to feed clabbered milk, or milk after it has become sour and thick and the whey has been drawn off. Animal food is very largely fed in the form of dried-beef scrap. This is manufactured by the large packing houses. It may be fed in hoppers where the fowls can get it at any time, or if mash, either dry or wet, be fed, it may be mixed with the mash. About 8 to 10 per cent as much dried-beef scrap as total grain should be fed laying fowls. (Ref. 14.)

GREEN FOOD.

Green food may be fed in a variety of forms. Dry or green clover or alfalfa—preferably the leaves—kale, cabbage, sugar beets, and mangels are all good. Kale, clover, and alfalfa give a good color to the yolk. Beets and mangels do not. Fowls must have a plentiful supply of green food at all times.

GRIT.

It is well to keep a constant supply of grit before poultry of all ages, unless they run on a soil containing plenty of grit. Gravel, crushed stone, lime mortar, and sharp sand are all valuable as grit.

LIME.

For heavy egg production the ordinary foods do not contain enough lime for the making of shells. Broken oyster shells serve this purpose well, and where they may be secured at reasonable price should be kept before the laying hens at all times. Lime mortar and broken limestone will also furnish egg-shell material.

POULTRY IN THE ORCHARD.

Poultry may often with advantage be kept in the orchard. This makes it possible to engage in poultry keeping on a considerable scale without any cost for land. In other words, a double use of the land may be made. The trees afford the necessary shade to the fowls in warm weather. It will be necessary to furnish them ample green food at all times, especially when the apples are on the ground. If no other green food is available they are liable to eat an injurious amount of apples. On the other hand, poultry are a decided advantage to the orchard as an aid in the warfare on insect enemies. The

colony system of housing the fowls should be used. By moving the houses frequently the fowls may always be kept on clean ground and the droppings will be distributed over the orchard. Fifty hens on an acre of bearing apple orchard will keep it in a high state of fertility, so far as nitrogen is concerned.

INCUBATION.

Successful incubation of chicks lies at the foundation of successful poultry keeping. The necessity of frequently renewing the flock makes it imperative that faulty incubation methods be avoided, otherwise loss of vigor in the stock will very soon result. Cases are not few where failure in the poultry business can be traced directly to a gradual lowering of vitality in the flock from faulty methods of incubation.

BREEDING STOCK.

To maintain the health and vigor of the flock it is very essential that the breeding stock be of strong vitality. No undersized or inferior fowls should be kept in the flock from which eggs for hatching are gathered. Such stock is not profitable to keep, either for laying or for breeding. This is important whether the natural or artificial method of incubation is used.

ARTIFICIAL INCUBATION.

Incubators, though they are largely used, have not been brought to that state of perfection in which they can be said to do as good work as the hen. (Refs. 6, 19, 20.) On the farm they are hardly necessary. Chicks may be conveniently and cheaply raised by using the hen for hatching and brooding. There is still a missing link in artificial incubation, and it is best for the present at least to follow the old and tried way.

NATURAL INCUBATION.

With care in the making of nests and the management of the sitting hens, chicks of good vigor may be raised in large numbers. Where it is desirable to set a large number of hens, they will be more conveniently looked after by making a bank of nests and placing it along the side of the poultry house or in some unused shed. The nests may be about 12 by 12 by 14 inches in size, made by taking two 12-inch boards for the top and bottom, and cutting another 12-inch board into 14-inch lengths for the partitions, then nailing them together, as many as desired. The top of the bottom row will furnish the bottom of the second row, and four or five rows of nests may thus be

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placed together. There should be a hinged board in front to confine the sitters. The hens should be let out every day to feed and drink for about fifteen minutes, the length of time depending on the weather conditions. Use several inches of fine waste hay in the bottom of the nests. Short-cut straw or clean chaff will also answer the purpose. Pyrethrum powder or tobacco dust should be used on the fowls and in the nests two or three times during the period of incubation to keep the lice in check. If lice are found on the heads and throats of the chicks two or three days after hatching, lard should be rubbed on those parts.

36¹ Another method of hen hatching in use at the Oregon Station is to use one coop for hatching as well as raising the chicks. This coop may be 5 feet long and 3 feet wide, with a shed roof 3 feet high at front and 2 feet at back. This is large enough to divide into separate apartments for four sitting hens, using movable partitions. These partitions are of canvas or burlap, with a 4 or 6 inch board at bottom. An outside run covered with wire netting for each hen gives her opportunity for exercise and dusting. By keeping feed and water in the runs all the time the hens may be allowed to leave the nest and return at will. In this way very little labor is required in caring for sitting hens. This house serves the double purpose of a hatching and brooding coop. It is large enough for the chicks to grow to maturity in. It should be moved to clean ground occasionally.

37 After hatching, 15 to 20 chicks may be given to one hen and the hen confined in a small coop for a few days till the chicks are strong enough to follow her. The bottom of the coop should be covered with clean sharp sand for the chicks to eat.

FEEDING THE CHICKS.

38 No food should be given the chicks for at least thirty-six hours after hatching, the yolk which the chick absorbs before hatching being sufficient to sustain life for three or four days; 39 too early feeding will cause bowel derangement. (Ref. 11.)

The first feed may be rolled oats or stale bread soaked in milk, and the milk is more important than the bread. Skim milk may profitably be kept before the chicks all the time for drink. A little hard-boiled egg and the milk will supply the demand for animal food for a week or two. If the hen can be turned onto free range where there is plenty of animal food, green food, and grit, the only feeding that will be necessary will be to keep a supply of cracked corn or wheat or wheat

screenings in a hopper or box where they can help themselves at will. The rapidity of growth will depend largely on the amount of animal food which the chicks find. Without the exercise which free range furnishes the chickens they should be fed their grain food in a litter of straw, chaff, or other scratching material to keep them busy. This litter should be about 10 inches deep. With chickens confined in yards it will also be necessary to feed them animal food and grit. A hopper of beef scrap and one of grit should be kept where the chickens can get to them at any time. A chick well hatched and provided with abundance of food, free range, and fresh-air coops will make vigorous growth and delight the owner "when the frost is on the punkin."

FATTENING CHICKENS.

Young cockerels that have free range on the farm possess a good frame and constitution, but they lack in flesh and in quality of meat. When fed in pens or crates for two or three weeks, they gain in flesh very rapidly, while the increase in the bones or frame is relatively very small. Professor Robertson demonstrated by experiment that one fattened chicken had as much edible material on its frame as three like chickens not fattened. (Ref. 16.) Young cockerels of the general-purpose breeds, 2 to 4 pounds in weight, are very economical producers of meat when confined in pens and fed properly. In Professor Robertson's experiments 131 chickens weighing 492 pounds gained in four weeks 335 pounds. The cost per pound of gain was 4.9 cents. This represents not only a gain in weight, but a gain in quality, and the market will pay much more for such chickens than for those direct from the range. From lack of exercise the muscles become more edible or tender. A considerable business in fattening or, more properly, fleshening chickens has grown up in several western States. This business is largely done by the large packing companies, who buy the chickens from the farmers and fatten them at fattening stations. This work might be done on the farm and the profit saved to the farmer. There is probably no class of live stock that will produce meat at less food cost than will young cockerels of the right age, and no other kind of farm animals sell at as high a price per pound as chickens.

RATIONS.

Which grain to use in fattening will be governed partly by its price. For best results the grain is ground and fed moist.

View.

It is usually mixed with skim milk or buttermilk. Professor Graham, of the Ontario Agricultural College, says that the best ration used at that station is one made of two parts finely ground oats, two of finely ground buckwheat, and one of corn meal, mixed with sour milk, using one and a half times as much milk as grain, and sometimes twice as much. Where the markets demand a yellow-flesh fowl, as most of them do in this country, a larger proportion of corn will be desirable in the ration; but corn alone will prove unsatisfactory. Equal parts of ground oats and corn meal should give good results. Ground oats alone, with the coarser hulls removed, will give good results where white flesh is not discriminated against. Barley may also form part of the ration. The chickens should be fed lightly the first week; after that all they will eat up clean three times a day. It is important that they be kept quiet, and the sexes should be separated. After three weeks of feeding, the chickens begin to lose their appetites, when they should be marketed.

PEN AND CRATE FATTENING.

The relative merits of pen and crate feeding have not been clearly demonstrated. In experiments conducted at the Canadian Experimental Farms the results were in favor of the pen method, while at the Ontario station the results were in favor of crate feeding. (Refs. 15, 16.) It is certain, however, that profitable results are secured from pen fattening, and it is doubtful whether it will pay the farmer to adopt the crate method, with its additional labor and expense. The use of the cramming machine is practicable only where large numbers of chickens are fed and where expert operators are available.

CAPONIZING.

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Caponizing is chiefly valuable in supplying the demand for high-class roasting chickens in late winter or early spring, when uncastrated males are salable only at low prices. The capon retains its good eating qualities till 10 or 12 months of age, when prices are good for such stock. Capons are very quiet or docile and put on flesh economically. It requires some skill to perform the operation of caponizing, but instructions accompany each set of instruments purchased. Unless the farmer possesses the necessary skill or can engage some one who has, and has accommodations for keeping the capons over winter, it will pay him better to fatten the cockerels and sell them in the late summer or fall.

MARKETING THE PRODUCT.

View.

To get the most from the poultry on the farm some attention must be given to methods of marketing the product. It will pay the farmer to cultivate a market in the city if he is within reasonable distance of it, so that he can make regular shipments. Where one farmer has not the necessary quantity to make shipments a little cooperation with his neighbors would be of mutual advantage. To secure and hold a select trade it will be necessary to give attention to several points usually neglected on the farm.

MARKETING EGGS.

Eggs vary in color, size, flavor, and keeping quality just as fruits vary, and it is of as much importance that the poultryman grade his eggs before marketing as it is for the fruit grower to grade his fruit. The nests in which the eggs are laid should be clean, otherwise the eggs will lack in keeping quality. The germs of decomposition enter the egg through the shell, and for this reason eggs laid in dirty nests will deteriorate in quality more rapidly than eggs laid in clean nests. The eggs should be gathered regularly each day, and broody hens should not be allowed to sit on them any length of time. They should be of uniform size and color. Where white eggs are demanded, select only white eggs, or keep a breed of fowls that lay white eggs. Those off in size and color should be discarded and sold in the local market. In every city there are reliable grocery stores that are willing to pay a premium for regular shipments of select eggs. It is possible by shipping eggs directly to the consumer to get higher prices. For this purpose special crates will be necessary. These may be similar in construction to the commercial egg crate but smaller, the size depending somewhat on the requirements of the individual customer. For shipping both eggs and poultry a combination crate may be used, putting eggs in one end and dressed poultry in the other. (Ref. 17.)

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MARKETING CHICKENS.

In selling chickens uniformity of product as well as quality should be considered. A crate of chickens of one breed and of the same size will find more ready buyers than a promiscuous lot of different sizes and different color. Whether the farmer ships the chickens alive or dressed will depend on market requirements and prices. In catering to a select retail trade,

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View.

it will usually be necessary to dress them, but the killing and dressing must be carefully done, otherwise it will pay better to ship them alive.

KILLING AND DRESSING.

Before killing, the chickens should be starved about twenty-four hours. Food remaining in the crop and intestines will injure the keeping qualities of the chicken and affect its sale. The most approved method of dressing chickens is to pluck them dry. They should be killed by sticking with a knife in the roof of the mouth. The bird is suspended by the legs, and picking begins as soon as the "stick" has been made. It requires some skill to make a good "stick." If picking is left till the bird begins to get cold, the feathers will be removed with difficulty. The chickens are usually undrawn, and the head and legs are left on. After dressing, the animal heat should be removed as quickly as possible, when they should be packed.

44 It is well, however, to study carefully the demands of the market as to dressing, as the requirements vary in different markets. It should be remembered always that cleanliness and neatness have a market value when applied to dressing chickens and packing them for shipment.

INSECT PESTS.

Insect pests are a cause of considerable losses in poultry keeping. It is useless to expect profit from the fowls where no attention is given to combating lice and mites. Where the fowls have access to dust baths they will keep themselves comparatively free from lice, but a dusting occasionally with insect powder or tobacco dust may be necessary. The mites, which are sucking insects, require different treatment. They are found usually in the nests and on the roost poles. The roosts and nests should be frequently examined, and when the mites are found, spraying with kerosene, or some effective spray, should be resorted to every three or four days. Fumigating the house with sulphur, where it is possible to close the house up tight, is also effective. One spraying or one fumigation, however, is not enough, because the eggs of the mites will not be killed, and in a few days a fresh crop of mites will hatch, and spraying should be repeated to kill successive broods. (Refs. 18, 21.)

APPENDIX.

LANTERN SLIDES.

No. of
view.

1. The beginning.
Original.
2. Flock of young White Plymouth Rocks. Indiana.
3. Part of poultry plant at Cornell University, showing gasoline-heated brooders.
4. Utah Agricultural College Experiment Station poultry houses.
5. Utah Station trap nest (original), front view.
The door is so balanced that the weight of the hen as she enters closes it and confines her until released.
6. Utah Station trap nests, another view.
7. View of two Maine Experiment Station hens, showing eggs laid by each in one year.
8. Utah Experiment Station fowls, with egg records of each.
Hen No. 5 laid 398 eggs in 2 years; No. 26, 385; No. 129, 200 in 4 years; No. 131, 442 in 2 years, and 677 in 4 years. Original.
9. Utah Experiment Station fowls.
All good layers. Hen No. 10 laid 199 eggs in 1 year; her daughter, No. 170, laid 201 eggs in 1 year; No. 361 laid 242 in 1 year. Original.
10. A lesson in poultry breeding.
Utah Station hen, daughter, and granddaughter. Record of hen, 190 eggs; of daughter, 226; and of granddaughter, 240. Original.
11. A Leghorn pullet.
A good specimen of the breed.
12. White Plymouth Rocks. Indiana.
13. White Wyandotte pullet, owned by Utah Experiment Station.
Record, 204 eggs. Original.
14. Light Brahma pullet.
Original.
15. Pen of Black Langshans, winners in Australian laying competition, 1906-7, at Hawkesbury Agricultural College.

No. of
view.

16. Pen of White Leghorns; second pen in laying competition.
17. Pen of Silver Wyandottes; among the winners.
18. Showing the necessity of frequently renewing the flock.
Original. The laying flock should be frequently renewed. The baskets represent number of eggs produced in experiments at Utah by pullets, hens 1 year old, and old hens, beyond what were sufficient to pay for the food eaten.
19. A California colony house with fences to keep live stock out of feed hoppers.
Original.
20. A Rhode Island colony house.
21. A Rhode Island colony house showing fences around feed.
22. California colony houses.
Original.
23. Tolman fresh-air house.
24. Utah Station colony house with cloth window.
Gave good results in cold winter. Original.
25. Same houses showing how nests may be arranged.
Original.
26. Colony house, Oregon Agricultural College.
Original.
27. Colony house, framework, Oregon Agricultural College.
Original.
28. A California poultry farm, where 8,000 laying hens are kept.
Houses scattered over the hills.
29. California colony houses showing trough for wet mash.
Original.
30. A California open-front house.
Original.
31. A colony house with open-front scratching shed attached.
Original.
32. A curtained-front house.

No. of
view.

33. Interior view of one pen of same house showing curtain open.
34. A warmly built house with glass windows; not conducive to good health.
Original.
35. A long continuous house without partitions.
Objectionable on account of draft. Building on an incline aggravates the trouble. Original.
36. Single small houses placed a distance apart permit of wide yards and easy cultivation.
Original.
- 36¹. A combination hen-hatching and brooding coop.
Original.
37. A convenient brood coop for hen and chicks.
38. A Rhode Island coop for hen and chicks.

No. of
view.

39. Movable colony coops at the Oregon Experiment Station.
By using a lamp and hover chicks are artificially brooded in these coops. They are also used for hatching by hens. By putting in partitions four hens are set in each house and the chicks are raised in them. This coop is 6 by 4 feet in size.
40. Dressed capons showing distinctive manner of dressing.
41. Small crate for shipping eggs to special customers.
42. A combination crate for shipping dressed poultry and eggs.
In shipping a distance during warm weather ice is used.
43. A uniform lot of well fattened and properly dressed fowls.
44. Neatness in dressing has a market value.
Two Wyandotte cockerels, 15 weeks old, weighing 9 pounds 10 ounces.

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